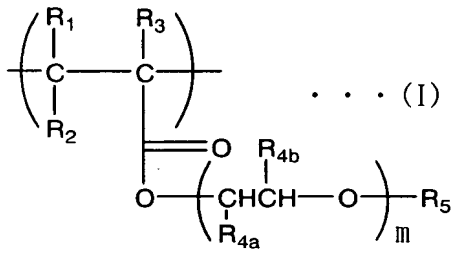
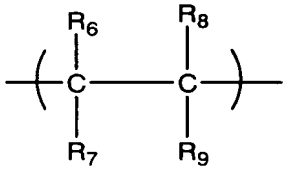
CLAIMS

1. A solid polymer electrolyte comprising an electrolyte salt, and a copolymer in which a block chain A containing a repeating unit represented by a formula (I) shown below:



(I)

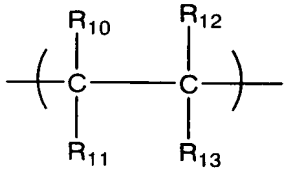
(wherein, R_1 to R_3 each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, R_1 and R_3 may be bonded together to form a ring, R_{4a} and R_{4b} each represent, independently, a hydrogen atom or a methyl group, R_5 represents a hydrogen atom, a hydrocarbon group, an acyl group, or a silyl group, m represents an integer from 2 to 100, and individual R_{4a} and R_{4b} groups are either identical or different), a block chain B containing a repeating unit represented by a formula (II) shown below:



(II)

(wherein, R_6 to R_8 each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, and R_9 represents an aryl group), and a block chain C are arranged in a sequence B, A, C.

2. A solid polymer electrolyte according to claim 1, wherein said block chain C contains a repeating unit represented by a formula (III) shown below:



. . . (III)

(wherein, R_{10} to R_{12} each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, and R_{13} represents an aryl group or a heteroaryl group).

3. A solid polymer electrolyte according to either one of claim 1 and claim 2, wherein said block chains A to C form a copolymer with a B-A-C bonding sequence.

4. A solid polymer electrolyte according to any one of claim 1 through claim 3, wherein a degree of polymerization of a repeating unit represented by said formula (I) is at least 10.

5. A solid polymer electrolyte according to any one of claim 1 through claim 4, wherein a degree of polymerization of a repeating unit represented by said formula (II) is at least 5.

6. A solid polymer electrolyte according to any one of claim 2 through claim 5, wherein a degree of polymerization of a repeating unit represented by said formula (III) is at least 5.

7. A solid polymer electrolyte according to any one of the claim 1 through claim 6, wherein a value of m in said formula (I) is an integer from 5 to 100.

8. A solid polymer electrolyte according to any one of claim 1 through claim 7, wherein a value of m in said formula (I) is an integer from 10 to 100.

9. A solid polymer electrolyte according to any one of claim 2 through claim 8, wherein said group R_{13} in said formula (III) is an aryl group, and a degree of polymerization of a repeating unit represented by said formula (III) is at least 5.

10. A solid polymer electrolyte according to any one of claim 1 through claim 9, wherein a molar ratio ((I)/((II)+C)) between repeating units represented by said formula (I), and a combined total of repeating units represented by said formula (II) and repeating units within said block chain C is within a range from 1/30 to 30/1.

11. A solid polymer electrolyte according to any one of claim 2 through claim 9, wherein a molar ratio ((I)/((II)+(III))) between repeating units represented by said formula (I), and a combined total of repeating units represented by said formula (II) and repeating units represented by said formula (III) is within a range from 1/30 to 30/1.

12. A solid polymer electrolyte according to any one of claim 1 through claim 11, wherein a number average molecular weight of said copolymer is within a range from 5,000 to 1,000,000.

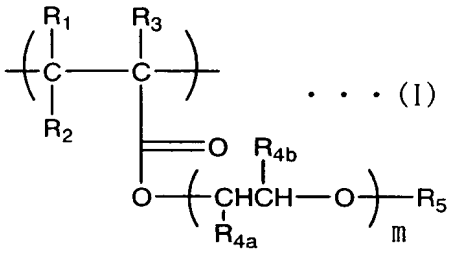
13. A solid polymer electrolyte according to any one of claim 1 through claim 12, which exhibits a microphase separated structure.

14. A solid polymer electrolyte according to any one of claim 1 through claim 13, wherein said electrolyte salt is one or more materials selected from a group consisting of

alkali metal salts, quaternary ammonium salts, quaternary phosphonium salts, transition metal salts, and protonic acids.

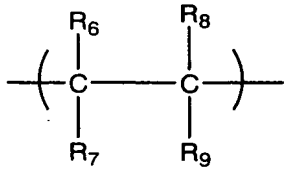
15. A solid polymer electrolyte according to any one of claim 1 through claim 13, wherein said electrolyte salt is a lithium salt.

16. A copolymer in which a block chain A containing a repeating unit represented by a formula (I) shown below:



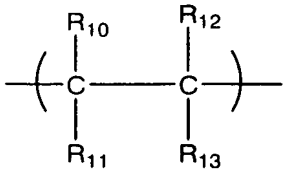
(I)

(wherein, R_1 to R_3 each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, R_1 and R_3 may be bonded together to form a ring, R_{4a} and R_{4b} each represent, independently, a hydrogen atom or a methyl group, R_5 represents a hydrogen atom, a hydrocarbon group, an acyl group, or a silyl group, m represents an integer from 2 to 100, and individual R_{4a} and R_{4b} groups are either identical or different), a block chain B containing a repeating unit represented by a formula (II) shown below:



(II)

(wherein, R_6 to R_8 each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, and R_9 represents an aryl group), and a block chain C containing a repeating unit represented by a formula (III) shown below:



· · · (III)

(wherein, R_{10} to R_{12} each represent, independently, a hydrogen atom or a hydrocarbon group of C1 to C10, and R_{13} represents an aryl group or a heteroaryl group) are arranged in a sequence B, A, C.

17. A copolymer according to claim 16, wherein said block chains A to C are bonded together in a B-A-C sequence.

18. A copolymer according to either one of claim 16 and claim 17, wherein a degree of polymerization of a repeating unit represented by said formula (I) is at least 10.

19. A copolymer according to any one of claim 16 through claim 18, wherein a degree of polymerization of a repeating unit represented by said formula (II) is at least 5.

20. A copolymer according to any one of claim 16 through claim 19, wherein a degree of polymerization of a repeating unit represented by said formula (III) is at least 5.

21. A copolymer according to any one of claim 16 through claim 20, wherein a value of m in said formula (I) is an integer from 5 to 100.

22. A copolymer according to any one of claim 16 through claim 20, wherein a value of m in said formula (I) is an integer from 10 to 100.

23. A copolymer according to any one of claim 16 through claim 22, wherein said group R_{13} in said formula (III) is an aryl group, and a degree of polymerization of a repeating unit represented by said formula (III) is at least 5.

24. A copolymer according to any one of claim 16 through claim 23, wherein a molar ratio ((I)/((II)+(III))) between repeating units represented by said formula (I), and a combined total of repeating units represented by said formula (II) and repeating units represented by said formula (III) is within a range from 1/30 to 30/1.

25. A copolymer according to any one of claim 16 through claim 24, wherein a number average molecular weight of said copolymer is within a range from 5,000 to 1,000,000.

26. A copolymer according to any one of claim 16 through claim 25, which exhibits a microphase separated structure.

27. A method of producing a copolymer according to any one of claim 16 through claim 26, which utilizes a living radical polymerization in which a transition metal complex is used as a catalyst, and an organohalogen compound comprising 1 or more halogen atoms is used as an initiator.

28. An ion conductive film containing a polymer comprising a polymer segment (P1) that displays ionic conductivity and a polymer segment (P2) that displays no ionic conductivity, wherein said film exhibits a network-type microphase separated structure.

29. An ion conductive film according to claim 28, wherein said polymer comprising P1 and P2 is a polymer in which said segments are arranged in a P2, P1, P2 sequence.